Remarks

The Final Office Action mailed May 13, 2003 has been carefully considered. A RCE is being filed to continue the examination of the application in view of new claims 25 and 26 and the following remarks. Support for the new claims are found in original filed claim 4 found at the top of page 28; for the variation of the composition of the monomer solution is found on page 10, paragraph 6 and for the variation of the graph basis on page 11 in the 6th paragraph.

The present invention is directed towards a polymer composition made by a continuous polymerization process in which a parameter of the process is varied by increasing and decreasing the parameter in a recurring pattern during the polymerization process. Examples of parameters that may be varied in the continuous polymerization process selected from the group consisting of the percentage of polymerizable monomer of part a) of claim 1, the percentage of the unsaturated monomer of part b) of claim 1, the amount of a crosslinking agent part c) of claim 1, the pH value of the polymerizable monomer during the process; and the degree of neutralization of the polymerizable monomer solution during the polymerizable process. The advantages of varying a parameter are shown in the examples of the present invention.

The Final Office Action rejected pending claims 1 and 6-12 under 35 U.S.C. § 102(b) as being anticipated by Dahmen et al. (USP 5,712,316). The Examiner opines that Dahmen et al. discloses powder formed crosslinked polymers for absorbing aqueous liquids using the process set forth in Dahmen et al. column 6 lines 7-10. The Examiner concludes the continuous polymerization process conditions for producing the same composition in Dahmen et al. would be inherent to the applicants' claimed compositions. However,

applicants cannot see in a continuous polymerization process as disclosed in Dahmen et al., where a parameter of the continuous polymerization is varied in a recurring pattern, even if the term "a parameter" could be considered as the temperature, the residence time or the amount of the ingredients.

In this context, applicants like to draw the Examiners attention to Yada et al. Yada et al. describes process for preparing polymer gel particles from an aqueous polymer gel obtained by subjecting an aqueous solution of a water soluble vinyl monomers to polymerization (see column 2, line 66 to column 3, line 2). According to column 4, lines 49-56, it is possible to obtain the polymer gel conducting continuous polymerization by continuously supplying an aqueous solution containing a monomer and a photo initiator onto a moving support, e.g. an endless belt in the form of a thin layer, irradiating ultraviolet rays to the thin layer to polymerize the monomer, and continuously peeling of the produced polymer layer.

The disclosure of Yada et al. can be seen as state of the art in the field of continuous polymerization of aqueous monomer solutions containing water-soluble monomers at the time the present invention was made. According to Examples 3 of Yada et al., 30 liters of a 75% aqueous solution of N,N,N-trimethylaminoethyl methacrylate chloride adjusted to pH 4 with a 10% aqueous solution of hydrochloric acid was thoroughly degassed with nitrogen gas, and was fed at a constant rate of 10 liters/hour from one end of a belt moving with a constant rate of 30 mm/minute. Two aqueous solutions containing potassium persulfate and sodium disulfite as polymerization initiators were admixed with the monomer solution at constant rate of 70 ml/hour. The thus obtained mixture on the belt was allowed to polymerize on the moving belt for 100 minutes.

In the continuous process that is described in Yada et al. not one parameter of the continuous polymerization process, including the temperature, the residence time and the amount of the ingredients, is varied during the polymerization process, let alone by increasing and decreasing the parameter in a recurring pattern. In this context applicants do not agree with the Examiner in that a moving support as mentioned in claims 5 and 17 is a "recurring pattern" in the sense of claim 1 as presently on file. A moving support as part of an apparatus for the continuous preparation of polymers can furthermore definitely not be seen as "a parameter of a continuous polymerization process". For a person skilled in the art, a parameter of a chemical reaction process is the temperature, the pressure, the reaction time, the amount of reactants and so on, but definitely not a part of the apparatus used for the chemical reaction. Accordingly, the use of a moving belt in Yada et al. alone does not inherently implicate that a parameter of the continuous polymerization is varied by increasing and decreasing in a recurring pattern.

In summary, Dahmen et al. does not teach or suggest one would vary a parameter by increasing and decreasing the parameter in a recurring pattern during the process. The Examiner's attention is directed to the examples 1 and 2 in the present application which demonstrates the variation of the concentration of the internal crosslinker, element c) of claim 1, "polyethylene glycol 300-diacrylate" and "polyethylene glycol 400 dimethacrylate", respectively, in Feed 6 lead to superabsorbent materials having higher AUL-values compared to those obtained by a process as disclosed in Dahmen et al. (US 5,712,316). In particular increased permeability of the SAP of the present invention is gained by varying the metering rate of polyethylene glycol 400 dimethacrylate from 5kg/h to 15kg/h and with a steady decrease to 5kg/h over a time period of 60 minutes (see the results in the table on page 26 of

the specification of the present application). The feature of varying the metering rate is not taught or suggested in Dahmen et al., which only discloses a general way of producing an absorbent polymer which is mainly based on partially neutralized acrylic acid and wherein the internally crosslinked absorbent polymer is surface crosslinked in a second step.

The Final Office Action rejected all the claims 1-3, 5-15 and 17-24 under 35 U.S.C. § 103(a) as being unpatentable over Dahmen et al. (USP 5,712,316). The Examiner states that Dahmen et al. disclose the claimed invention as discussed above under the 102 rejection. As stated above, Dahmen et al. fails to explicitly or inherently disclose the feature of varying the parameters during the polymerization process as required in the present claims. Dahmen et al. fails to teach or disclose to vary a parameter by increasing and decreasing the parameter in a recurring pattern. As above, the Examiner's attention is directed to Examples 1 and 2 which demonstrate the variation of the concentration of the internal crosslinker, element c) of claim 1, "polyethylene glycol 300-diacrylate" and "polyethylene glycol 400 dimethacrylate", respectively, in Feed 6 lead to superabsorbent materials having higher AUL-values compared to those obtained by a process as disclosed in Dahmen et al. (US 5,712,316). In particular, increased permeability of the SAP is gained by varying the metering rate of polyethylene glycol 400 dimethacrylate from 5kg/h to 15kg/h and with a steady decrease to 5kg/h over a time period of 60 minutes.

In view of the present invention, the object was to improve the absorbency properties, in particular the absorption under load (AUL) of water absorbing polymers. According to Dahmen et al. this object was solved by using a blowing agent that yields a microporous structure in the water absorbing polymers. To the contrary of Dahmen et al., the present

invention solves this object by varying at least one parameter during the polymerization according to a recurring pattern.

The AUL is a property of the SAP that assesses the absorption capability of a water-absorbing polymer when pressure is applied on the water-absorbing polymer while the polymer is formed due to the absorption of water or of a saline solution. This application of pressure simulates a pressure that occurs on the water-absorbing polymer when incorporated in a core of a diaper and an infant sitting on the diaper. It is highly appreciated with regard to the overall absorbent performance of a diaper when the water-absorbing polymer exhibits a high AUL value even under high pressures. For example, a high AUL reduces the probability of leaking from the diaper.

The comparison of the AUL values under higher pressure of table 1, column 7 in Dahmen et al. with the high-pressure AUL values of the tables on page 23 and 25 of the present application shows that the present invention exhibits significantly higher AUL values. The AUL values with a load of 40g/cm^2 in table 1 of Dahmen et al. are 15g/g and 9g/g. In contrast to this, the AUL values under a load of 50g/cm^2 in the present application are 24, 23.5, 26 or 23, respectively. Accordingly, the AUL values of the present invention even under a higher load compared to the load applied in Dahmen et al. are at least a factor of 2 higher than the AUL values of Dahmen et al., which were measured under a lower load.

This result shows an affect being unexpected for the person skilled in the art since there is neither teaching nor suggestion in Dahmen et al. Moreover, Dahmen et al. teaches away from the technical teaching used in the present invention in order to solve the object course. Dahmen et al. does not disclose or suggest varying a parameter but teaches to use a blowing agent in order to solve the above-discussed object.

The above argumentation is supported by the comparison of examples 1 and 2 with comparative example of the present application. The AUL value with a load of 50g/cm^2 of 24, 23.5, 26 or 23, respectively, is almost equal or significantly higher than the AUL of 23.5 of the water absorbing polymer in accordance to comparative example 1 as shown in the table on page 26 of the specification of the present application. Moreover, the table on page 26 of the specification of the present application clearly shows that besides the all most equal AUL the water-absorbing polymer in accordance to the present invention exhibits a significantly higher gel permeability (GP). The gel permeability is also a desired feature for the overall performance of a water-absorbing polymer incorporated in a core of a diaper. The measurement of the gel permeability is an indicator for the occurrence of gel blocking. The higher the GP the less is the tendency of the water absorbing polymer to show gel blocking when contacted with water or a saline solution.

In summary, the present invention shows various unexpected effects over the teaching of Dahmen et al. Therefore, the subject matter of the currently pending claims of the present invention is not obvious and does involve inventive step.

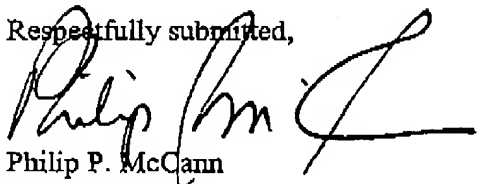
The Office Action rejected all the pending claims 1-3, 5-15 and 17-24 under 35 U.S.C. § 103(a) as being unpatentable over Dahmen et al. (USP 5,712,316) in view of Yada et al. (US Patent 4,690,788). The Examiner relies on Dahmen et al. as stated above. In addition the Examiner states that Yada et al. discloses a continuous process for producing particles of polymer gel prepared by polymerizing an aqueous solution of water-soluble vinyl monomers onto a moving support and concludes it would have been obvious to one of ordinary skill in the art to use a polymer gel in Dahmen et al. which can be manufactured on the moving support suggested by Yada et al.

As already stated above, in the continuous process described in Yada et al., not one parameter of the continuous polymerization process is varied during the polymerization process, let alone by increasing and decreasing the parameter in a recurring pattern.

Combining Dahmen et al. and Yada et al. fail to disclose varying the defined parameters during the polymerization process as required in the present claims.

In view of the foregoing remarks, this case is in condition for allowance and such action is respectfully requested. If any issues remain unresolved, applicant would welcome the opportunity for a telephone interview to expedite allowance and issue.

Respectfully submitted,



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